REMARKS

Claims 1-18 were pending in the Application prior to the outstanding Office Action. In the Office Action, claims 7 and 14-16 were rejected under 35 U.S.C. §112, second paragraph. Claims 15 and 18 were rejected 35 U.S.C. §102(b). Claims 1-14, and 16-17 were rejected under 35 U.S.C. §103(a). Applicants have cancelled claims 2, 9-10, 12, 14, and 16-18 and added new claims 19-24.

I. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §112, SECOND PARAGRAPH

In paragraphs 2-3 of the Office Action mailed July 18, 2003, the Examiner rejected claims 7 and 14-17 under 35 U.S.C. §112, second paragraph.

A. Dependent Claim 7

Applicants have amended claim 7 to clarify that each component is associated with the "radial drive housing." Applicants respectfully assert that amended claim 7 satisfies the requirements set forth under 35 U.S.C. §112, second paragraph.

B. Independent Claim 14

Applicants have cancelled claim 14.

C. Independent Claim 15

Applicants have amended claim 15 to correct the typographical errors noted by the Examiner. First, the terms "does," "ends," and "the wafer support" recited in claim 15 have been deleted. Second, Applicants have amended claim 15 to clarify that a single device is used for "simultaneously rotating said slide body and said means for moving said slide body between a third and fourth position." Applicants respectfully assert that amended claim 15 satisfies the requirements set forth under 35 U.S.C. §112, second paragraph.

D. Independent Claim 16

Applicants have cancelled claim 16.

E. Independent Claim 17

Applicants have cancelled claim 17.

II. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §102(b)

In paragraph 6 of the Office Action mailed July 18, 2003, the Examiner rejected claims 15 and 18 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,928,390 issued to Yaegashi et al. ("*Yaegashi*").

Yaegashi describes a processing station 20 that includes multiple vertically stacked process chambers. "As is shown in FIG. 1, a vertically movable main wafer transfer mechanism 21 is provided in a central part of the process station 20." *Yaegashi*, 6: 11-13. As shown in Fig. 7, "the main wafer transfer mechanism 21 has a columnar support body 70 comprising a pair of mutually facing vertical wall portion 71 and 72 coupled to each other at their upper and lower ends." *Yaegashi*, 9: 49-52. The lower end of the body 70 "is coupled to a rotary shaft of a rotational drive motor 74." *Yaegashi*, 9: 54-56. A rotational shaft 70a, extending from the upper end of the body 70, is secured to the station frame. Thus, the support body 70 only pivots about a theta-axis, which is defined by the longitudinal central axis of the rotational shaft 70a and rotary shaft of the motor 74. "A wafer transfer member 73 is disposed inside the support body 70 so as to be vertically movable (in direction Z)." *Yaegashi*, 9: 52-54. Wafers are transferred between the vertically stacked process chambers by coordinating the rotary motion of the body 70 (theta axis), the vertical motion of the wafer transfer member 73 (z axis), and the horizontal motion of the support forks 78a-78c (x-axis).

A. Independent Claims 15 and 18

Even though Applicants believe that the wafer engine recited in claims 15 and 18 are patently distinguishable over *Yaegashi*, Applicants have cancelled claims 15 and 18.

B. New Claims 19-23

The wafer engine recited in new claims 19-23 is patently distinguishable over *Yaegashi*. Claims 19-23 recite a wafer engine that, among other things, includes:

"a linear drive assembly having a carriage, said linear drive assembly for moving said carriage between a first and second position along a first linear path, said first linear path defining an x-axis;

a base mounted to said carriage;"

The wafer engine recited in claim 19 can move along an "x-axis." In contrast, the wafer transfer mechanism 21 in *Yaegashi* is stationary in the x-direction – it only rotates in place. Therefore, the wafer engine recited in claim 19 is not anticipated by *Yaegashi*. Claims 20-23 depend directly or indirectly from independent claim 19. Each of these claims incorporates the limitations recited in independent claim 19. Therefore, Applicants respectfully assert that claims 20-24 are patentable for at least the same reasons discussed concerning independent claim 19.

III. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §103(a)

In paragraphs 7-10 of the Office Action mailed July 18, 2003, the Examiner rejected claims 1-14 and 16-17 under 35 U.S.C. §103(a) as being unpatentable over *Yaegashi* in several combinations with the following references:

- U.S. Patent No. 6,147,329 issued to Okamura et al. ("*Okamura*");
- U.S. Patent No. 5,794,487 issued to Solomon et al. ("*Solomon*");
- U.S. Patent No. 6,002,840 issued to Hofmeister ("*Hofmeister*"); and
- U.S. Patent No. 6,327,517 B1 issued to Sundar ("*Sundar*").

Okamura describes a resist process system that includes a coating development section 15. A robot 16 "is provided at a center portion of the coating-development unit 15." *Okamura*, 4: 21-22. The robot 16 moves horizontally within the center portion along a track 31 (*see* Fig. 2). The robot includes two wafer supporting arms 32, 33 that "can be moved forward and backward independently from each other." *Okamura*, 4: 40-41. The wafer supporting arms 32, 33 "are also able to rotate." *Okamura*, 4: 41-42.

Solomon describes a drive system for a conventional dual-link robotic arm 24. The robotic arm 24 has "a lower arm link 26, an upper arm link 28, and a hand or end effector 30." *Solomon*, 3: 9-11. In the Fig. 3 embodiment, each arm link 26, 28 includes "a high-density metallic or ceramic filter 170,172 ... mounted in the bottom wall 26' of

the arm link or arm 'hub'." *Solomon*, 6: 45-47. The filters "provide a dense barrier against entry or exit of particles from the arm links." *Solomon*, 6: 47-48.

Hofmeister describes a conventional dual-link robot arm 24 having an upper arm 31, a forearm 32 rotatably attached to the upper arm 31, and an end effector 40 rotatably mounted to the forearm 32. The robot 24 "remove[s] substrates from the cassette 26, aligns the substrate to suite [sic] the process that will be applied in the substrate processing device 14, and inserts the substrates into the load locks 12." *Hofmeister*, 2: 28-31. The end effector 40 includes a substrate aligner 42 – a rotatable vacuum chuck 44.

Sundar describes a three-joint robot that can align a wafer while it is seated on the robot's end effector. "Each joint of the transfer robot is controlled by a motor housed at the base of the robot." *Sundar*, 5: 15-17. Figs. 1-3 in *Sundar* illustrate that the robot's base rotates in place to align the end effector with one of the process chambers 125, 130 or a load-lock chamber 105, 110. Figs. 4-5 in *Sundar* illustrate another embodiment of a wafer transfer robot – frog-leg type robot 445. This robot's base still only rotates in place to transfer wafers between the process chambers or a load-lock chamber.

Yaegashi* in view of *Okamura

In paragraph 7 of the Office Action, the Examiner rejected claims 1-7, 9-12, and 14 under 35 U.S.C. § 103(a) as being unpatentable over *Yaegashi* in view of *Okamura*. Applicants have cancelled claims 2, 9-10, and 12.

A. Independent Claim 1 Patently Distinguishes over *Yaegashi* in view of *Okamura*

Claim 1 recites a wafer engine that, among other things, includes:

> "a linear drive assembly having a carriage, said linear drive assembly for moving said carriage between a first and second position along a first linear path, said first linear path defining an x-axis;
>
> a base mounted to said carriage;"

The "linear drive assembly" moves the wafer engine recited in claim 1 along the x-axis. In contrast, the wafer transfer mechanism 21 described in *Yaegashi* cannot move along the x-axis. Only one portion of the wafer transfer mechanism 21 - the support forks 78a-78c - is able to move along the x-axis. In fact, *Yaegashi* teaches away from moving the wafer transfer mechanism 21 along the x-axis. First, *Yaegashi* describes that, "[a]s shown in FIG. 1, a vertically movable main wafer transfer mechanism 21 is provided in a central part of the process station 20." [emphasis added] *Yaegashi*, 6: 11-13. Second, the lower end of the body 70 "is coupled to a rotary shaft of a rotational drive motor 74." *Yaegashi*, 9: 54-56. The rotational drive motor 74 is a stationary structure. Third, a rotational shaft 70a, extending from the upper end of the body 70, is rotatably secured to the process station frame. With both ends of the body 70 rotatably coupled to a structure, the body 70 cannot move along an x-axis – it simply pivots about a theta-axis (*see* Fig. 7 of *Yaegashi*). Therefore, Applicants respectfully suggest that the wafer engine recited in claim 1 is not obvious in view of *Yaegashi*.

Moreover, neither *Yaegashi* nor *Okamura* provides any motivation for one of ordinary skill in the art to mount the wafer transfer mechanism 21 described in *Yaegashi* on the linear track 21 described in *Okamura*. *Yaegashi* teaches away from mounting the wafer transfer mechanism 21 on a track to move it along an x-axis. *Yaegashi* describes that the body 70 of the wafer transfer mechanism 21 must be rotatably coupled at each end to allow the body 70 to rotate about a theta-axis.

Second, the wafer transfer mechanism 21 in *Yaegashi* cannot simply be mounted on the track 31 described in *Okamura*. The body 70 of the wafer transfer mechanism 21 is a tall z-stroke structure. The theta axis in *Yaegashi* must be a substantially vertical axis. Thus, the rotational shaft 70a extending from the upper surface of the body 70 must be rotatably coupled to a fixed structure to prevent the upper portion of the body 70 from moving along the x-axis as the body 70 rotates about the theta axis. The track 31 described in *Okamura* only engages the bottom portion of the robot 16. *Okamura* does not provide any motivation to modify the track 31 by, for example, adding a second upper track to rotatably support the rotational shaft 70a as the body 70 in *Yaegashi* moves along the track 31.

Third, mounting the wafer transfer mechanism 21 in *Yaegashi* on the track 31 in *Okamura* without the additional upper track would provide a very unstable transfer system. The body 70 of the wafer transfer mechanism 21 comprises a pair of mutually facing vertical wall portions 71 and 72. The two walls 71 and 72 provide a tall z stroke structure. If the motor 74 of the wafer transfer mechanism 21 in *Yaegashi* was mounted on the track 21 in *Okamura*, the body 70 forms a tall cantilever structure that is supported only at the bottom (the lower end of the body 70 "is coupled to a rotary shaft of a rotational drive motor 74." *Yaegashi*, 9:54-56). The rotary shaft would not provide proper support at the base of the body 70. Especially while the wafer transfer mechanism 73 is located a the top of the body – creating a high center of gravity that is only supported at the base. A tall columnar structure, such as the wall portions 71 and 72, are not very stable when only supported at the bottom. Therefore, Applicants respectfully suggest that the wafer engine recited in claim 1 is not obvious over *Yaegashi* in view of *Okamura*.

B. Dependent Claims 2-7 and 9-10 Patently Distinguish over *Yaegashi* in view of *Okamura*

Applicants have cancelled claims 2 and 9-10. Dependent claims 3-7 depend directly or indirectly from independent claim 1. These dependent claims include all of the limitations of the independent claim from which they depend. Applicants respectfully assert that dependent claims 3-7 are allowable for at least the reasons set forth above concerning independent claim 1.

C. Independent Claim 11 Patently Distinguishes over *Yaegashi* in view of *Okamura*

Claim 11 recites a wafer engine that, among other things, includes:

"a first drive assembly providing motion between a first and second position along a first linear path, said first linear path defining an x-axis;

a base mounted to said first drive assembly, said base having a bore;"

The wafer engine recited in claim 11 is able to move along an "x-axis." For at least the reasons previously discussed above with regard to claim 1, the wafer transfer recited in claim 11 is not obvious over *Yaegashi* in view of *Okamura*.

Yaegashi* in view of *Okamura*, and further in view of *Solomon

In paragraph 8 of the Office Action, the Examiner rejected claim 8 under 35 U.S.C. § 103(a) as being unpatentable over *Yaegashi* in view of *Okamura*, as applied above to claim 1, and further in view of *Solomon*.

Claim 8 depends directly from independent claim 1 and therefore, includes all of the limitations of claim 1. Claim 1 recites a wafer engine that, among other things, includes:

> "a linear drive assembly having a carriage, said linear drive assembly for moving said carriage between a first and second position along a first linear path, said first linear path defining an x-axis;
>
> a base mounted to said carriage;"

For at least the reasons previously discussed above with regard to claim 1, claim 8 is not obvious over *Yaegashi* in view of *Okamura*.

Moreover, *Solomon* does not provide the elements missing from *Yaegashi* in view of *Okamura*. *Solomon* describes a drive system for a conventional dual-link robotic arm 24. The robot arm 24 is rotatably mounted onto a base 22. The base 22 is stationary. The arms of the robot extend, retract, and rotate to transfer wafers between process stations. *Solomon* provides no motivation to modify the base 22 so that it can move along an x-axis. Therefore, Applicants respectfully suggest that the wafer engine recited in claim 8 is not obvious over *Yaegashi* in view of *Okamura*, and further in view of *Solomon*.

Yaegashi* in view of *Okamura*, and further in view of *Hofmeister

In paragraph 9 of the Office Action, the Examiner rejected claim 13 under 35 U.S.C. § 103(a) as being unpatentable over *Yaegashi* in view of *Okamura*, as applied above to claim 1, and further in view of *Hofmeister*.

Claim 13 depends directly from claim 11. Claim 11 recites a wafer engine that, among other things, includes:

> "a linear drive assembly having a carriage, said linear drive assembly for moving said carriage between a first and second position along a first linear path, said first linear path defining an x-axis;
>
> a base mounted to said carriage;"

For at least the reasons discussed above concerning claim 1, the wafer engine recited in claim 11 is not obvious over *Yaegashi* in view of *Okamura*. The wafer engine recited in claim 11 further includes:

> "a radial drive housing removably mounted to said z-axis drive assembly, said radial drive housing containing a radial drive assembly adapted to move between a first and second position within said radial drive housing along a third linear path, said linear path defining a radial axis; and
>
> an end effector mounted to said radial drive assembly."

In contrast, the robot 24 described in *Hofmeister* includes an arm assembly 25 that "has three arm sections in series including an upper arm 31, a forearm 32, and an extended wrist 34." *Hofmeister*, 3: 1-3. Wafers must be removed and inserted in to the process chambers along a linear path. The motion of all three arm sections must be precisely coordinated to move the wrist 34 along a linear path. Coordinating the movement of all three arms is much more complex than motion from "a radial drive assembly adapted to move between a first and second position within said radial drive housing along a third linear path." Therefore, Applicants respectfully suggest that the wafer engine recited in claim 13 is not obvious over *Yaegashi* in view of *Okamura*, as applied above to claim 1, and further in view of *Hofmeister*.

Yaegashi* in view of *Sundar

In paragraph 10 of the Office Action, the Examiner rejected claims 16-17 under 35 U.S.C. § 103(a) as being unpatentable over *Yaegashi* in view of *Sundar*. Even

though Applicants believe claims 16-17 are in condition for allowance, Applicants have cancelled claims 16-17.

Additional Remarks

The references cited by the Examiner but not relied upon have been reviewed, but are not believed to render the claims unpatentable, either singly or in combination.

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application are allowable, and a Notice of Allowance is requested.

Enclosed is a PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. §1.136 for extending the time to respond up to and including today, January 16, 2004.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-0639 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

Date: 1.20.04

By: _____
Scott D. Sanford
Reg. No. 51,170

Scott D. Sanford, Esq.
O'MELVENY & MYERS LLP
Embarcadero Center West
275 Battery Street, 26th Floor
San Francisco, California 94111-3344
Telephone: (415) 984-8700
Facsimile: (415) 984-8701
Email: ssanford@omm.com

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